PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)
	)
Petrovic	) Examiner: P. Callahan
	)
Application No.: 10/763,288	) Art Unit: 2137
	)
Filed: January 26, 2004	)

For: **APPARATUS AND METHOD FOR EMBEDDING AND EXTRACTING INFORMATION IN ANALOG SIGNALS USING DISTRIBUTED SIGNAL FEATURES AND REPLICA MODULATION**

Mail Stop: Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

I hereby certify that this correspondence is being deposited with the United State Postal Service as First Class Mail, postage prepaid, in an envelope addressed to: Mail Stop: Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, September 28, 2007.

By: Michele Hollis
Michele Hollis

RESPONSE

Dear Sir:

This Response is responsive to the Office Action mailed on August 21, 2007.

Summary

Claims 1-6, and 8-26 are pending.

Claims 8-26 are allowed.

Claims 1-6 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Tewfik (US 6,282,299) in view of Leighton (US 5,644,018).

Applicant respectfully traverses these rejections in view of the following comments.

Discussion of 35 U.S.C. § 103(a) Rejections

Claims 1-6 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Tewfik in view of Leighton.

Discussion of Claim 1 Rejection

Tewfik discloses methods and apparatus for video watermarking using perceptual masks. Discrete objects are extracted from video host data that is made up of a number of successive frames. Each object is assigned and embedded with a watermark. The watermark is embedded by generating the watermark, applying it to a perceptual (frequency) mask of the block, spatially (non-frequency) masking the resulting block, and re-adding the block to that spatially masked result. The objects are collected in a database so that an object may be tracked as it is transformed from frame to frame of the video host data (Col. 2, lines 25-34).

Leighton discloses a watermarking system that is resilient to collusion attacks. Each of set of copies of the work has a slightly modified form of a "baseline" watermark that is placed within a critical region of the data. The slight variations in the watermarks are not perceptually visible and do not interfere with the work. If multiple persons collude to create an illicit copy of the work (i.e., without the watermark), at least one of the modified watermarks is present in the copy, thereby identifying both the illicit copy and the copier (Abstract).

With Applicant's invention as set forth in claim 1, a method for detecting the presence of auxiliary information symbols encoded onto host signals is provided. An encoded host signal is received and an auxiliary information carrier is detected from the received encoded host signal. The auxiliary information carrier is comprised of a plurality of signal components having varying amount of delay or offset from each other. The encoded host signal is correlated with the auxiliary information carrier to obtain a correlation value. The presence of the auxiliary information symbols may be detected from the correlation value.

Leighton is different from Applicant's claim 1 in at least two ways:

- First, the detection of Leighton watermark requires the retrieval of a previously-stored original offset watermark vector from memory, and a subsequent subtraction from a derived watermark vector:

> *Then the method [of detecting the watermark] proceeds at step 34 by retrieving the original baseline watermark, $x_1, x_2, \ldots, x_n$, from memory and subtracting out $x'_1, x'_2, \ldots, x'_n$ from $x_1, x_2, \ldots, x_n$ to compute a derived watermark $w'_1, w'_2, \ldots, w'_n$ at step 36.*

(Leighton, Col. 3, Lines 57-60; Fig. 2).

In contrast to Leighton, Applicant's claim 1 requires neither 1) retrieving the original baseline watermark from memory, nor 2) subtracting out a derived watermark vector $x'_1, x'_2, \ldots, x'_n$.

- Second, Leighton does not disclose or remotely suggest correlating the encoded host signal with the auxiliary information carrier. Rather, Leighton discloses computing a correlation value between the watermark value derived from the suspect image and the original watermark value. The original watermark value is created at the time of embedding, stored, and subsequently retrieved in order to perform this correlation:

> *[as part of the embedding process,] an n-length watermark vector $w_1, w_2, \ldots, w_n$ is then created at step 16 and stored at step 18 for future reference."*

(Leighton, Col. 3, Lines 39-41).

> *[as part of the detection process,] a correlation value (preferably an inner product) is then calculated between the derived watermark [$w'_1, w'_2, \ldots, w'_n$] and $w_1, w_2, \ldots, w_n$, retrieved at step 38, to produce a correlation value at step 40."*

(Leighton, Col. 3, Lines 60-64).

Thus, neither of the two signals used to carryout the correlation computation in Leighton constitutes the encoded host signal as set forth in Applicant's claim 1.

The Examiner relies on Tewfik as disclosing that the auxiliary information carrier is comprised of a plurality of signal components having various amounts of delay or offset from each other and refers to col. 3, lines 35-50 and to col. 7, line 60 to col. 8, line 8 of Tewfik (Office Action, page 3). Neither of the sections of Tewfik cited by the examiner discuss or remotely suggest having an auxiliary information carrier comprised of plurality of signal components with varying amounts of delay or offset from each other, as claimed by Applicant. Rather, Tewfik teaches generating a noise-like sequence, y, using a pseudo-random number generator. This

number generator uses two random keys (i.e., initial seed values) to generate the noise-like sequence:

> *The author has two random keys x1 and x2 (i.e., seeds) from which the pseudo-random sequence y can be generated using a suitable cryptographic operator g(x1,x2), as known within the art. The noise-like sequence y, after some processing, is the actual watermark hidden into the video stream. The key x1 is author dependent. The key x2 is signal dependent. In particular, x1 is the secret key assigned to (or chosen by) the author. Key x2 is computed from the video signal which the author wishes to watermark. The signal dependent key is computed from the masking values of the original signal.*

(Tewfik, Col. 3, lines 35-47.)

There is nothing in Tewfik to suggest that the noise-like sequence y comprises a plurality of signal components with varying amount of delay or offset from each other. Neither is there any suggestion that the random seeds have any relation whatsoever to one another.

As for the second cited section of Tewfik (i.e., col. 7, line 60 to col. 8, line 8), this section discusses embedding an image by first dividing up the image into nxn blocks, and then inserting an independently recoverable watermark into each block:

> *In step 38, the image data within frame k 32 is segmented into blocks ... In one embodiment, the image data is segmented as has already been described in conjunction with FIG. 2. Using a traditional approach, the blocks may be nxn (e.g., 8x8 like JPEG). An option at this stage is to segment the image data of the frame into blocks of objects and texture regions, or square blocks of data. Blocking the image adds detection robustneses to cropping and localized signal processing.*

(Tewfik, Col. 7, lines 37-46.)

> *In step 44, the unique signature, or watermark, for each block, is also transformed into the frequency domain by DCT. The signature can be of any type, such as that has been described in conjunction with FIG. 1, a pseudo-noise (PN) code, etc. In particular, the*

signature may be a type of PN code known as an m-sequence. Note that a different signature sequence is used for each image block B.

(Tewfik, Col. 7, lines 59-66.)

While this section cited by the examiner does deal with embedding a watermark, there is nothing in this section or in any other section of Tewfik which remotely suggest embedding or detecting watermarks using an information carrier signal comprised of plurality of signal components having varying amounts of delay or offset from each other. Rather, Tewfik, as best understood, specifies that each image block is selected independently and then separately embedded with watermarks. Furthermore, the detection of a watermark from a given image block is independent from the detection of a watermark from any other blocks within the image. The reason for such segmentation is to increase the robustness against cropping or other localized signal processing.

Accordingly, one skilled in the art could not have arrived at Applicant's claimed invention based on the combination of Tewfik and Leighton. In particular, Leighton does not disclose or remotely suggest correlating an encoded host signal with an auxiliary information carrier to obtain a correlation value as claimed by Applicant. Further, Tewfik does not disclose or remotely suggest an auxiliary information carrier that is comprised of a plurality of signal components having varying amount of delay or offset from each other as claimed by Applicant.

Discussion of Claim 2 Rejection

Applicant's claim 2 specifies that the auxiliary information symbol detecting step comprises the step of determining a sign of the correlation value. The Examiner relies on Leighton in rejecting the subject matter of claim 2.

The arguments set forth above in connection with independent claim 1 apply equally to Applicant's claim 2.

In addition, Leighton does not discuss determining the sign of the correlation value. Rather, Leighton teaches comparing a correlation value to a threshold level, and if the correlation is high, concluding that a watermark present. In fact, Leighton actually teaches away from

evaluating the sign of the correlation value by specifying that the absolute value of the correlation value needs to be computed:

> *A correlation value (preferably an inner product) is then calculated between the derived watermark and w_1, w_2, ..., w_n, retrieved at step 38, to produce a correlation value at step 40. The correlation value is compared at step 42 to threshold levels, and if the correlation is high (step 44), then there is a match and a watermark is present. If the correlation is low (step 46), the watermark is not present. (The inner product scheme works by computing the absolute value of the sum $w_1w'_1+ \ldots +w_nw'_n$).*

(Leighton, Col. 3, line 60 to Col. 8 line 2 (emphasis added)).

Discussion of Rejections of Claims 3-6

The arguments set forth above in connection with independent claim 1 apply equally to Applicant's claims 3-6. Applicant's silence as to any of the Examiner's comments is not indicative of an acquiescence to the stated grounds of rejection.

Applicant respectfully submits that the present invention would not have been obvious to one skilled in the art in view of the combination of Tewfik and Leighton, or any of the other prior art of record.

Further remarks regarding the asserted relationship between Applicant's claims and the prior art are not deemed necessary, in view of the foregoing discussion.

Withdrawal of the rejections under 35 U.S.C. § 103(a) is therefore respectfully requested.